Docket Number: A-1559

#14

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Guell et al.

Serial No: 09/608,234 / Group Art Unit: 2673

Filed: 6/30/2000 / Examiner: Lun Yi Lao

For: EXTERIOR AIRCRAFT VISION SYSTEM USING A HELMET-MOUNTED DISPLAY

Commissioner for Patents
Mail Stop Appeal Brief -- Patents
P.O. Box 1450
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APPELLANT'S BRIEF (37 CFR 1.192)

Sir:

This brief is in furtherance of the Notice of Appeal filed in this case on August 8, 2003. A transmittal letter, including a Certificate of Mailing, accompanies this brief.

This brief is submitted in triplicate (37 CFR 1.192(a)).

REAL PARTY IN INTEREST (37 CFR 1.192(c)(1))

The assignee of record is the real party in interest.

RELATED APPEALS AND INTERFERENCES (37 CFR 1.192(c)(2))

There are no related appeals or interferences previously or currently pending.

STATUS OF CLAIMS (37 CFR 1.192(c)(1)

The application on appeal, as filed, contained 20 claims, of which claim 1 was independent. Claims 21-26 have been subsequently added by amendment, of which claim 22 was independent. Presently, claims 1-26 stand rejected, having been finally rejected on May 1, 2003. No claims stand allowed. Thus, the status of the claims is as follows:

canceled claims -- None

allowed claims -- None

claims objected to -- None

claims rejected -- 1-26

claims withdrawn -- None

The claims on appeal are Claims 1-26.

STATUS OF AMENDMENTS (37 CFR 1.192 (c)(2))

An amendment was filed on March 20, 2003, which was entered. No other amendments have been filed or entered. The foregoing section listing the present status of the claims takes into account all amendments of record.

SUMMARY OF THE INVENTION (37 CFR 1.192 (c)(3))

The Appellants' invention is directed to an enhanced vision system for mobile vehicles, particularly aircraft, which includes an array of vision sensors fixedly mounted on the exterior of the vehicle, each sensor being capable of generating image signals. As shown in the illustrated embodiment, an aircraft 20 includes a nose 22 on which is mounted a plurality of imaging sensors 32. These sensors are arrayed to provide an azimuthal field of view of a desired scope, and supply signals to an electronic imaging system 34. The imaging system 34, in turn, processes the signals from the sensors 32 and outputs them to a helmet-mounted display 36. A tracker 38 monitors movement of the helmet-mounted display 36 and provides that information to the imaging system 34. In this manner, real-time movements of the operator wearing the helmet-mounted display 36

causes the imaging system 34 to alter which imaging sensor 32, or combination of sensors, is sampled. This feedback loop thus permits the operator to scan across a number of images produced by the sensors 32 by simply turning his or her head.

For the convenient reference of the Board, a copy of the claims on appeal is presented in Appendix A, and a copy of appealed claim 1, modified to include representative reference numerals, is presented in Appendix B.

ISSUES (37 CFR 1.192 (c)(4))

1. Whether claims 1-3, 6-8, 10-14, 17, and 20-21 are patentable in view of the Examiner's rejection of the claims under *35 U.S.C. 103(a)* as being unpatentable over Hale et al. '394.

2. Whether claim 9 is patentable in view of the Examiner's rejection of the claim under *35 U.S.C. 103(a)* as being unpatentable over Hale et al. '394 in view of Hale et al. '364.

3. Whether claims 4-5 and 15 are patentable in view of the Examiner's rejection of the claims under *35 U.S.C. 103(a)* as being unpatentable over Hale et al. '394 in view of Myrick '780.

4. Whether claims 18 and 19 are patentable in view of the Examiner's rejection of the claims under *35 U.S.C. 103(a)* as being unpatentable over Hale et al. '394 in view of Muller '782.

5. Whether claim 16 is patentable in view of the Examiner's rejection of the claims under *35 U.S.C. 103(a)* as being unpatentable over Hale et al. '394 in view of Myrick '789 and Kaneko '418.

6. Whether claims 22-24 and 26 are patentable in view of the Examiner's rejection

of the claims under *35 U.S.C. 103(a)* as being unpatentable over Hale et al. '394 in view of Okamura et al. '343.

7. Whether claim 25 is patentable in view of the Examiner's rejection of the claim under *35 U.S.C. 103(a)* as being unpatentable over Hale et al. '394 in view of Okamura et al. '343 and Krouglicof et al.

GROUPING OF CLAIMS (37 CFR 1.192 (c)(5))

It is Appellant's position that, for the purposes of determining the merits of the issues on appeal, claims 1-21 generally stand or fall together, and claims 22-26 generally stand or fall together.

ARGUMENT (37 CFR 1.192 (c)(6))

Issue 1 -- The Examiner rejected claims 1-3, 6-8, 10-14, 17, and 20-21 under 35 U.S.C. 103(a) as being unpatentable over Hale et al. '394.

Appellant respectfully traverses the Examiner's interpretation of the Hale et al. '394 patent. The Examiner incorrectly stated, in the final rejection issued on May 1, 2003, that Hale et al. "teach a display for receiving output signal from the processor (20,39) and superimpose it on the see-through visor which also selectively permits an operator to view actual image disposed in (sic) from the visor (see figures 1, 2; column 4, lines 1-18 and lines 65-68; and column 5, lines 1-26)." However, in actuality, the referenced figures and passages specifically support Appellants' position that Hale et al. does not teach a "conformal system", as claimed, wherein selected images generated from the sensor system are superimposed over actual visual images viewed by the naked eye of the operator through the see-through visor. Rather, Hale et al. teaches a system wherein the images seen by the operator are entirely those generated by the sensors and selected by the operator using selector 26. The Hale et al. system is designed so that the "selected portions typically would correspond to image positions around the operator's line of sight

as established by the headgear" (col. 4, lines 13-16), but they are still entirely artificially generated images.

The Examiner apparently acknowledges that Hale et al. does not teach the usage of staring type sensors, as claimed, but rather, specifically teaches the usage of turret-mounted, movable sensors. However, the final rejection proposes that "Hale et al. have disclosed a large number of staring sensors fixed to a host platform with maximal coverage with minimal moving parts would reduce cost and more reliable (sic) (see column 1, lines 65-68 and column 2, line 1)". Based on this conclusion, the Examiner states that it "would have been obvious to have sensors (71-74) comprising a non-turret mounted immovable sensors (sic) since those sensors (71-74) mounted on the vehicle (airplane 70) have corresponding fields of view (81, 82, 83, 84) which together almost entirely surround the airplane...".

Appellants do not understand the Examiner's position at all. The passage referenced by the Examiner in Hale et al. teaches away from using staring type sensors. This passage, relied upon by the Examiner, is in the background portion of the patent specification, and actually states that it has been suggested in the prior art that large parallel arrays of staring type sensors, rather than serial gimballed sensor scanners, would be advantageous, but the patentees did not agree that they were. Rather, the passage noted by the Examiner (the part he conveniently ignores) actually states that such parallel fixed arrays have a number of problems, including a long processing time, platform motion which creates vibration problems, and increased complexity, requiring greater processor load and consequent greater cost (see col. 2, lines 5-30).

The Hale et al. patent, consequently, teaches that staring-type sensors (of the type claimed in the present application) are inappropriate for systems of the type disclosed. Adjustable (gimbaled) sensors, disposed on turrets, and adjusted by means of servo-motors, are utilized in order to permit the sensor to compensate for motion or vibration of the underlying platform (col. 3, lines 3-20 and 55-57, Figs. 4-7, col. 5, lines 45-65). Thus, the Examiner's rejection requires that the basic premise of the Hale et al. patent be destroyed, by replacing the adjustable servo-controlled sensors with fixed staring-type sensors, even though Hale et al. specifically teach away from doing that. Clearly,

therefore, the rejection is improper. *Bausch & Lomb, Inc. v. Barnes-Hind/Hydrocurve, Inc.*, 230 U.S.P.Q. 416 (Fed. Cir. 1986), *Specialty Composites v. Cabot Corp.*, 6 U.S.P.Q.2d 1601 (Fed. Cir. 1988).

More particularly with reference to the claims on appeal, independent claim 1 recites that each of the claimed vision sensors are non- turret mounted immovable sensors. In contrast, as noted above, the Hale et al. patent discloses sensors 1-4, which, as shown in Fig. 4 thereof, are disposed in movable fashion on the vehicle. Servo motor 60 is disclosed as permitting "major changes in the position of the detector 1" (col. 5, lines 60-65). Additionally, the claim recites that the system, which superimposes the output signal on the visor, also selectively permits an operator to view actual images disposed in front of said visor. The system at issue is a "conformal" system, meaning that the system is conformal to the outside world, and the superimposed image matches 1 to 1 with the outside world view. On the other hand, the Hale et al. '394 patent is not a conformal system, despite the Examiner's unsupported assertions to the contrary. There is no disclosure that the visor employed therein permits actual images to be passed therethrough. Rather, the operator sees, exclusively, the images generated from the sensors 1-4.

In the Advisory Action, dated July 22, 2003, the Examiner first repeats his point that "...Hale et al. teach a display (28) connected to receive the output signal from the processor (20, 39) and superimpose it on a see-through visor which also selectively permits an operator to view actual imaged (sic) disposed in front of the visor as cited in claim 1...". As we have already explained, Hale et al. does not disclose a see-through visor, and does not suggest or disclose imposing an artificial sensor-generated image over an actual image observed through the visor, as claimed. Rather, in Hale et al. '394, the image is disclosed as being entirely artificially generated. The passages referenced by the Examiner in Hale et al. '394 (Figs. 1 and 2, col. 4, lines 1-18 and 65-68, and col. 5, lines 1-26) clearly disclose only images generated by the sensors. It is not clear why the Examiner appears to be consistently confused on this point, despite Appellants' repeated explanations of Hale et al.'s actual teachings, unless he is erroneously reading the statement at col. 4, lines 13-18, which states that the digitally generated images selected

by the operator may be selected to correspond with image positions around the operator's line of sight. As is obvious, however, these are still artificially generated images, not images actually visible through the visor. There is no disclosed or suggested provision for viewing actual images through a see-through visor, either alone or in combination with the digitally generated images, as claimed.

The Examiner's reference to col. 1, lines 14-20 as supporting his assertion that Hale et al. "teach actual images..." is even more incomprehensible, since this passage clearly references the artificial generation of image signals using sensing devices such as video cameras or infrared detectors. Furthermore, this passage is merely a discussion of prior art, not a teaching of Hale et al.

A second point the Examiner inexplicably asserts in the Advisory Action is that "...Hale et al. teach staring type sensors (71-74) mounted on an aircraft which is admitted by applicants...". Appellants strongly traverse this assertion, which is completely opposed to the position he took in the Final Rejection! Appellants have gone to great lengths to clearly demonstrate that sensors 71-74 are not staring type sensors, but rather movable, gimballed sensors, as is apparent from the above discussion. In the final rejection, the Examiner acknowledged this difference, but asserted that it would have been obvious to replace the movable sensors with staring type sensors in the Hale et al. system. However, now in the Advisory Action, the Examiner asserts that Hale et al. teaches that sensors 71-74 are staring type sensors. This statement is absolutely wrong! Sensors 71-74 are movable sensors, as clearly established in the prosecution record of the present application.

To support his strange contention, the Examiner references a passage in Appellant's specification for support, namely, page 2, lines 5-6. However, this passage, in the background portion of the specification, merely states that Hale et al. '394 disclose the prior existence of systems having staring-type sensors. As discussed above, this is true, but they are disclosed in the background portion of the Hale et al. '394 patent, and are specifically disclosed as being inferior because of concerns about vibration and the like. Thus, Hale et al. discloses an inventive system which replaces the prior art staring type sensors for movable gimbaled sensors, to compensate for such vibration.

Appellants, on the other hand, have inventively found a way to design a system which can use the staring type sensors effectively, without the disadvantages discussed by Hale et al. '394.

Thus, claim 1 is clearly patentable over the Hale et al. '394 patent, together with all of the rejected dependent claims 2-3, 6-8, 10-14, 17, and 20-21.

For all of the foregoing reasons, the rejection of claims 1-3, 6-8, 10-14, 17, and 20-21 under 35 U.S.C. 103(a) as being unpatentable over Hale et al. '394. is clearly improper, and should be reversed.

Issue 2 -- The Examiner rejected claim 9 under 35 U.S.C. 103(a) as being unpatentable over Hale et al. '394 in view of Hale et al. '364. For the reasons discussed above, with respect to Issue 1, this rejection cannot stand, since claim 1 is patentable over the Hale et al. '394 Patent, Hale et al. '364 does not disclose or suggest the deficiencies of Hale et al. '394 relative to claim 1, and claim 9 is dependent upon claim 1.

For all of the foregoing reasons, the rejection of claim 9 under 35 U.S.C. 103(a) as being unpatentable over Hale et al. '394 in view of Hale et al. '364 is clearly improper, and should be reversed.

Issue 3 -- The Examiner rejected claims 4-5 and 15 under 35 U.S.C. 103(a) as being unpatentable over Hale et al. '394 in view of Myrick '789. For the reasons discussed above, with respect to Issue 1, this rejection cannot stand, since claim 1 is patentable over the Hale et al. '394 Patent, Myrick '789 does not disclose or suggest the deficiencies of Hale et al. '394 relative to claim 1, and claims 4-5 and 15 are dependent upon claim 1.

For all of the foregoing reasons, the rejection of claims 4-5 and 15 under 35 U.S.C. 103(a) as being unpatentable over Hale et al. '394 in view of Myrick '789 is clearly improper, and should be reversed.

Issue 4 -- The Examiner rejected claims 18 and 19 under 35 U.S.C. 103(a) as being unpatentable over Hale et al. '394 in view of Muller '782. For the reasons discussed

above, with respect to Issue 1, this rejection cannot stand, since claim 1 is patentable over the Hale et al. '394 Patent, Muller '782 does not disclose or suggest the deficiencies of Hale et al. '394 relative to claim 1, and claims 18-19 are dependent upon claim 1.

For all of the foregoing reasons, the rejection of claims 18 and 19 under 35 U.S.C. 103(a) as being unpatentable over Hale et al. '394 in view of Muller '782 is clearly improper, and should be reversed.

Issue 5 -- The Examiner rejected claim 16 under 35 U.S.C. 103(a) as being unpatentable over Hale et al. '394 in view of Myrick '789 and Kaneko '418. For the reasons discussed above, with respect to Issue 1, this rejection cannot stand, since claim 1 is patentable over the Hale et al. '394 Patent, neither Myrick '789 nor Kaneko '418 disclose or suggest the deficiencies of Hale et al. '394 relative to claim 1, and claim 16 is dependent upon claim 1.

For all of the foregoing reasons, the rejection of claim 16 under 35 U.S.C. 103(a) as being unpatentable over Hale et al. '394 in view of Myrick '789 and Kaneko '418 is clearly improper, and should be reversed.

Issue 6 -- The Examiner rejected claims 22-24 and 26 under 35 U.S.C. 103(a) as being unpatentable over Hale et al. '394 in view of Okamura et al. '343. However, independent claim 22 is similar, in many respects, to patentable claim 1, in that immovable vision sensors are recited, together with the capability of viewing, together, actual and superimposed images on the display screen. Hale et al. '394 does not disclose or suggest these important claim features. Also, the claim recites a controller which permits varying levels of intensity of light to be transmitted through the screen or for alternatively selectively disabling selected regions of the screen so that light cannot pass through those selected regions. The Examiner admits that Hale et al. '394 does not disclose such a controller, but suggests that the Okamura et al. patent discloses such a controller, and that it "would have been obvious to have modified Hale et al. with the teaching of Okamura et al., so an operator could both view outside image and the electronic image". This rationale is fatally flawed, because Hale et al. '394, for reasons

discussed above in connection with Issue 1, does not disclose a system wherein the operator can view both outside image and the electronic image. Thus, there would have been no motivation for applying the teachings of Okamura et al. to the Hale et al. system, as suggested by the Examiner. Furthermore, even if such a combination were made, the combined references still would not have disclosed or suggested a system having staring-type (immovable) sensors, as recited in claim 22.

Since claims 23-24 and 26 depend upon claim 22, these claims are patentable as well.

For all of the foregoing reasons, the rejection of claims 22-24 and 26 under 35 U.S.C. 103(a) as being unpatentable over Hale et al. '394 in view of Okamura et al. '343 is clearly improper, and should be reversed.

Issue 7 -- The Examiner rejected claim 25 under 35 U.S.C. 103(a) as being unpatentable over Hale et al. '394 in view of Okamura et al. '343 and Krouglicof et al. For the reasons discussed above, with respect to Issues 1 and 6, this rejection cannot stand, since claim 22 is patentable over the Hale et al. '394 Patent, in view of Okamura et al. '343, and Krouglicof et al. does not disclose or suggest the deficiencies of Hale et al. '394 and Okamura et al. '343 relative to claim 22, and claim 25 is dependent upon claim 22.

For all of the foregoing reasons, the rejection of claim 25 under 35 U.S.C. 103(a) as being unpatentable over Hale et al. '394 in view of Okamura et al. '343 and Krouglicof et al. is clearly improper, and should be reversed.

Therefore, Appellant respectfully submits that the rejections of record of all

appealed claims 1-26 are improper, and should be reversed.

Respectfully submitted,

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APPENDIX A (37 CFR 1.192 (c)(7))

The text of the claims on appeal are:

1. An enhanced vision system for mobile vehicles, comprising:

an array of vision sensors fixedly mounted on the exterior of a vehicle, each sensor comprising a non-turret mounted immovable sensor and being capable of generating image signals;

a recording medium for storing the image signals from the array of vision sensors;

a processor for sampling the stored image signals from the recording medium and producing an output signal therefrom;

a display connected to receive the output signal from the processor and superimpose it on a see-through visor which also selectively permits an operator to view actual images disposed in front of said visor; and

a tracking system associated with the display that monitors the movement of the head of the operator and transmits a tracking signal to the processor, the processor producing the output signal based on feedback from the tracking signal.

2. The system of claim 1, wherein the vehicle is an aircraft, and wherein the array of vision sensors is mounted close to the cockpit area such that the image signals originate from a location proximate the wearer of the display.

3. The system of claim 2, wherein the array of vision sensors is mounted in the upper radome area of the nose of the aircraft.

4. The system of claim 1, wherein the vision sensors are infrared sensors, and wherein one of the infrared sensors has higher resolution than the others and is forward-looking.

5. The system of claim 4, wherein the higher resolution infrared sensor is located in the center of the array of vision sensors.

6. The system of claim 1, wherein the vehicle is an aircraft, and wherein the array of vision sensors is mounted in the nose area and has a downwardly-looking elevational field-of-view.

7. The system of claim 6, wherein the array of vision sensors has an elevational field-of-view of approximately 24°.

8. The system of claim 1, wherein the vehicle is an aircraft, and wherein the array of vision sensors is mounted in the nose area and has a field-of-view straddling the horizontal horizon.

9. The system of claim 8, wherein the array of vision sensors has an elevational field-of-view of approximately 51°.

10. The system of claim 1, wherein the array of vision sensors provides at least a hemispherical field-of-view.

11. The system of claim 10, wherein the array vision sensors provides a spherical field-of-view.

12. The system of claim 1, wherein at least one of the vision sensors additionally provides an infrared search and track function.

13. The system of claim 1, further including at least one other sensor separate from the array of vision sensors that provides a separate signal to the processor that then combines it with the output signal.

14. The system of claim 13, wherein the one other sensor is a vision sensor oriented differently than the array of vision sensors.

15. The system of claim 14, wherein the array of vision sensors is forward-looking, and wherein the one other vision sensor is rearward-looking.

16. The system of claim 14, wherein the array of vision sensors provide a series of adjacent image signals that are combined by the processor into a wide field-of-view output signal, and wherein the signal from the one other vision sensor is overlaid on the wide field-of-view output signal as a picture-in-picture image.

17. The system of claim 13, wherein the one other sensor generates a real-time map signal that is combined by the processor into the output signal and displayed on the

display outside an image produced by the array of vision sensors.

18. The system of claim 13, wherein the one other sensor monitors an operational parameter of the vehicle and generates a corresponding signal.

19. The system of claim 18, wherein the operational parameter of the vehicle is selected from the group consisting of:

speed;

altitude;

attitude; and

engine status.

20. The system of claim 1, and further including a manual input device to the processor, wherein the output signal may be manually disabled in select areas on the helmet-mounted display.

21. The system of claim 1, wherein said display comprises a helmet-mounted display.

22. An enhanced vision system for mobile vehicles, comprising:

an array of vision sensors immovably mounted on the exterior of a vehicle, each sensor being capable of generating image signals;

a processor for producing an output signal from a selected sampling of said image

signals;

a display connected to receive the output signal from the processor and superimpose it on a see-through screen which also selectively permits an operator to view actual images disposed in front of said screen; and

a controller for controlling an intensity of light permitted to pass through said screen and for alternatively selectively disabling selected regions of said screen so that light cannot pass through those selected regions.

23. The system of claim 22, wherein said display comprises a helmet-mounted display, and said screen comprises a helmet visor.

24. The system of claim 23, and further comprising a tracking system associated with the helmet-mounted display that monitors the movement of the head of the wearer of the display and transmits a tracking signal to the processor, the processor producing the output signal based on feedback from the tracking signal.

25. The system of claim 24, wherein said tracking system comprises an emitter fixedly mounted on a helmet of the operator and a detector disposed in spaced relation to said emitter.

26. The system of claim 22, wherein said controller includes a manual override capability so that the operator can selectively manually control and select particular output images from various ones of said sensors.

APPENDIX B

For convenience, a copy of representative claim 1 on appeal, including reference numerals drawn from the figures, is presented below. It is to be understood, however, that this presentation is solely for the convenience of the members of the Board of Appeals, as suggested in the ***Notice of May 3, 1988*** (1092 O.G. 26-35), and that the claims are not to be limited thereby, but rather to be construed solely in light of the disclosure. Furthermore, the reference numerals are merely representative, in that the numerals from other various embodiments could be substituted in their stead.

1. An enhanced vision system for mobile vehicles (20), comprising:

an array of vision sensors (32) fixedly mounted on the exterior of a vehicle (20), each sensor comprising a non-turret mounted immovable sensor and being capable of generating image signals;

a recording medium (64) for storing the image signals from the array of vision sensors;

a processor (34) for sampling the stored image signals from the recording medium and producing an output signal therefrom;

a display (36) connected to receive the output signal from the processor and superimpose it on a see-through visor which also selectively permits an operator to view actual images disposed in front of said visor; and

a tracking system (38) associated with the display that monitors the movement of the head of the operator and transmits a tracking signal to the processor, the processor producing the output signal based on feedback from the tracking signal.